Motion and Sound

3-5 The student will demonstrate an understanding of how motion and sound are affected by a push and pull on an object and the vibration of an object (Physical Science)

3.5.8 Explain how the vibration of an object affects pitch.
Taxonomy level: 2.7-B Understand Conceptual Knowledge

Previous/Future knowledge: Students have not been introduced to the concept of how vibrations can affect pitch in previous grades. In 8th grade (8-6.3), students will summarize factors that influence the basic properties of waves (including frequency, amplitude, wavelength, and speed).

It is essential for students to know how the vibrations of an object affect pitch of a sound. Pitch depends on how fast an object is vibrating. Pitch is affected by the materials vibrating in the following ways:

Length
- *Length* of an object can change the vibration and cause the pitch to change.
- Shorter materials vibrate faster than longer ones.
- The faster a string, wire, or air in a tube vibrates, the higher the pitch of the sound.
- For example, when you shorten the length of a guitar string it makes a higher pitched sound.

Thickness
- *Thickness* can change pitch.
- Thinner strings or wires vibrate faster than thicker ones.
- Thinner vibrating materials have a higher pitch than thicker ones when they are vibrated.
- For example, when a thick rubber band and a thin rubber band are plucked, the thinner one produces a higher pitched sound.

Tightness
- *Tightness* of the stretch of the string or wire can change the pitch—the tighter the stretch of the string, the higher the pitch of the sound.
- For example, guitars and pianos have screws that can tighten the wire.
- Tightening the wire to tune the instrument can change the pitch.
- Tighter wires vibrate faster, making the pitch higher.

It is not essential for students to know why the speed of the vibrations affects the pitch of the sound or the quantitative relationship between frequency and energy of sound waves.

Assessment Guidelines:
The objective of this indicator is to *explain* how the vibration of an object affects pitch; therefore the primary focus of assessment should be to construct a cause-and-effect model of the factors that affect the pitch of various sounds and how they are related to the vibrations of objects. However, appropriate assessments should also require students to *illustrate* with pictures, diagrams, or words different factors that affect vibrations indicating which will produce the highest or lowest pitch; *compare* strings stretched to various degrees of tightness related to

highest or lowest pitch when plucked; or *recognize* the relationship between smallest length and highest pitch.